

Degree project on analyzing next-generation biological drugs - a collaboration with AstraZeneca

This project focuses on the next-generation biologics and is a collaboration between the Fundamental Separation Science Group (FSSG), AstraZeneca and related companies (see www.fssg.se/degree-projects)

Background:

Oligonucleotides represent one of the most important breakthroughs in the pharma industry today. New and automated synthetic chemistry has made large scale manufacturing of oligonucleotides possible, in addition this new chemistry enables the synthesis of oligonucleotides with desired sequence and various modifications. Moreover, this new class of drugs has the potential to treat cancer, cardiovascular and metabolic conditions, neurological disorders and ophthalmic diseases where there are unmet patient needs. Up to date, five new oligonucleotide drugs have reached the market and several clinical studies are ongoing.

These promising new drug candidates are typically 8-50 nucleotides long, single stranded DNA or RNA. Even though the oligonucleotide interacts via ordinary Watson-Crick base pairing, the folded structure of mRNA means that only parts of the sequence are available for binding. Unmodified oligonucleotides are readily degraded in cells via phosphodiester cleaving enzymes. Several chemical modifications have therefore been investigated, not only to prevent degradation of the oligonucleotide but also to increase binding affinity.

Specific tasks for this degree project:

This project deals with research tools such as chromatographic separation, modeling and simulation for analyses of oligonucleotide based pharmaceuticals of interest for AstraZeneca. Our research group has recently identified several interesting “white spots” concerning the application of chromatography to analyze and purify synthetic oligonucleotides. Depending on your particular interest such areas can involve evaluating of existing and novel chromatographic stationary phases for analyzing/purifying oligonucleotides, or you can focus on deeper understanding of separation methods such as ion-pair chromatography. We will discuss that and together agree on a good plan for your degree work.

About you:

We think that this project is suitable for the engineering programs molecular Biotechnology/Bioinformatics (X) but also for students in Master programs such as Biotechnology/Bioinformatics or Chemistry with focus on Analytical chemistry/Biochemistry or similar. Applicant should have an interest for analytical separation techniques such as liquid chromatography. It is an advantage if you have experience in scientific computing to manage and manipulate data using languages such as Python/MATLAB. It is important you like laboratory work.

Your placement:

Pharmacognosy, Department of Medicinal Chemistry, Uppsala University, BMC.

If the project progresses according to plan, travel money will be available for visits to AstraZeneca, and the other companies, to hold presentations and/or to do laboratory work

Are you interested?

Please contact: Torgny Fornstedt, Prof. in Analytical Chemistry, Karlstad University & Prof. in Analytical Biotechnology, Uppsala University (torgny.fornstedt@kau.se; 073 271 28 90).